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Center for the Study of Reading

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174 Children's Research Center
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Abstract

Structural analysis--the use of word parts to help determine the meaning and pronunciation of words--is an important component of skilled reading, and occupies a considerable amount of space in many reading programs. In this report, we review and evaluate the structural analysis instruction and practice in the teachers' manuals and student workbooks of six published reading programs. For the most part, suggestions for instruction and practice seemed reasonable, but there were systematic deficiencies: Students were almost never warned of the limitations of structural analysis, were seldom advised to check the results of word analysis against context, and were seldom asked to apply structural analysis in the task of constructing meaning in extended texts. We recommend that structural analysis instruction focus on the strategic use of word parts, in conjunction with other sources of information such as context, with a focus on the goal of gaining meaning from text.

STRUCTURAL ANALYSIS: TOWARD AN EVALUATION OF INSTRUCTION

Structural analysis is usually defined as the use of word parts to help determine the meaning and pronunciation of words. Our concern in this report is with the place of structural analysis in reading instruction and, in particular, with how structural analysis instruction is presented in published reading programs.

Three of us are reading educators, each with extensive elementary school classroom experience, and one is a linguist, whose primary research interest is how children acquire word knowledge. Although our interest in structural analysis arises from differing perspectives, the work we describe in this report was motivated by our shared curiosity about the effectiveness of classroom instruction in structural analysis, and the extent to which existing practice has any basis in research.

We observed that most published reading programs devote a considerable amount of space in many grade levels of their teacher's manuals, student texts, and workbooks to very specific suggestions and exercises for teaching structural analysis. Yet, we found little research that demonstrates the contributions of structural analysis instruction to reading achievement and still less that compares the relative efficacy of different instructional approaches.

The contrast between the amount of interest given to structural analysis, as compared to that given to phonics, also interested us. A lot of theories, beliefs--and as a matter of fact, emotions--are associated with phonics instruction. In contrast, only a little research--and as far as we can determine, no emotion at all--is associated with structural analysis.

In an attempt to examine this somewhat unexamined aspect of reading instruction, we decided to look at the presentations of structural analysis in some published reading programs and to consider these presentations in light of what is known from research about the role of structural analysis in word identification and vocabulary acquisition. Before reporting on our examination of these reading programs, we will discuss the role of structural analysis in reading, define some of the terms frequently associated with it, and identify some of the differences between the domains of phonics and structural analysis.

The Role of Structural Analysis in Reading

Vocabulary size is highly correlated with reading ability; the more words students know, the better able they are to understand text. Part of the advantage good readers have, then, is that they are familiar with a greater proportion of the words in a text and, conversely, encounter new words less often.

One might conclude from the strong relationship between vocabulary knowledge and reading comprehension that the best readers are those who never encounter unfamiliar words, and that it would be desirable for readers to know all of the words in a text before they began reading. But having students know all the words in a text before they read is not necessary, not always attainable, and, in fact, not always desirable.

Why shouldn't a reader be expected to know all the words in a text before reading it? Because, simply stated, English contains a relatively small number of words that occur very frequently and an extremely large number of words that occur only infrequently. For example, average fifth-grade students read somewhere around a million words of text in one year, if all reading, both in and out of school, is included (Anderson, Wilson, & Fielding, 1988). A good deal of what these students read consists of highly frequent words that they encounter over and over again. For example, the word *the* will occur

about 70,000 times; hence this word alone will make up about 7% of the text. All in all, about 75% of the text will consist of repeated occurrences of the thousand most frequent words in the language (Carroll, Davies, & Richman, 1971). However, one word in a hundred, or approximately 10,000 words in the course of a year's reading, will be seen only once in a year. Some of these may happen to be words that the student has seen in previous years, but the majority will be words that the student has never before seen in print.

It is hardly feasible for teachers to teach directly the 10,000 words that a student will encounter just once in fifth grade. But even if they could, that would do little to prepare students for the flood of new words they will encounter the next year. Rather, students need means of dealing with words they have not seen before. Proficient reading depends not just on recognizing the most frequent words in the language effortlessly and automatically--although this is certainly important--but also on knowing how to cope with the many low-frequency words that one encounters in normal reading.

How do skilled readers deal with a word they have not seen in print before? Three sources of information are available to them: (a) phonics, to determine the word's pronunciation; (b) context, to infer the word's meaning; and (c) structural analysis, or knowledge of word parts, to determine both the word's meaning and pronunciation.

Although phonics--in the sense of the knowledge of how written symbols are related to spoken sounds--is always an important component of skilled reading, its contribution is greatest in first and second grades when many of the words students encounter in print are already in their oral vocabularies. In such cases, phonics gives access to both the sound and meaning of the words. After third grade, however, more and more of the new words students encounter in print are *not* words that they have heard before, so phonics gives little help with meanings of new words.

Context plays an important role in reading, both as an aid to decoding and as a way of figuring out the meanings of new words. We believe that the bulk of students' vocabulary growth comes through learning the meanings of new words from context while reading. In most cases, however, context gives only partial information about the meaning of a word, so that learning a word meaning from context requires multiple encounters with that word (Jenkins, Stein, & Wysocki, 1984; Nagy, Anderson, & Herman, 1987; Schatz & Baldwin, 1986). It should be noted that in some cases, natural text gives misleading information about the meanings of words (Beck, McKeown, & McCaslin, 1983).

Structural analysis provides students with information about both the meaning and pronunciation of a word. Like context, structural analysis is not foolproof; for example, knowing the meaning of *casual* does not reveal the meaning of *casualty*. Nevertheless, in most cases, structural analysis yields useful information. Nagy and Anderson (1984) estimate that more than 60% of the new words a reader encounters contain prefixes, roots, or suffixes that give a clear indication of their meaning. For at least another 10% of new words, word parts give substantial, though incomplete, information about the word's meaning.

Thus, the bulk of the 10,000 or more words that the average student sees only once in a year of reading are not really "new." More than half are clearly related to more familiar words. A fifth-grade student probably does not even recognize words such as *unromantic*, *metalware*, or *quietness* as new in any way. Such words are not a problem to the reader if--and this is a big *if*--that reader automatically recognizes their relationship to their more familiar stems. Herein lies the chief importance of structural analysis to skilled reading.

Structural Analysis: Defining Its Scope

To begin, we want to make clear what we mean by the term *structural analysis*. Our initial definition of structural analysis was "the use of word parts to help determine the meaning and pronunciation of words." This simple definition, though accurate, does not clearly distinguish structural analysis from phonics. In fact, there is some inherent fuzziness in the boundary between these two instructional domains. Both have as a major goal that students will be able to deal with new words by breaking them into smaller, more familiar parts. Nevertheless, it is helpful to make as clear a distinction as possible.

To some extent, structural analysis and phonics can be distinguished according to their purposes. The goal of phonics instruction is to help students determine the pronunciation of unknown words, whereas structural analysis has as its primary goal the determination of meaning. Yet, even when the focus is on figuring out the meaning of an unfamiliar word (e.g., determining that *botanophobia* means "fear of plants"), the analysis of a word into familiar meaningful parts is a helpful step in determining its pronunciation as well.

More fundamentally, structural analysis differs from phonics in the type of word parts that are used. In phonics, the relevant word parts are units of pronunciation, whereas in structural analysis, the relevant word parts are units of meaning.

When a word is analyzed into units of sound, the resulting parts might be individual letters, digraphs, consonant clusters, onsets and rimes, or syllables. When a word is analyzed into units of meaning, on the other hand, the resulting parts are morphemes, or minimal units of meaning.

The distinction between units based on meaning and units based on sound is fundamental. Dividing a word into morphemes is not the same as dividing a word into syllables. *Walked* consists of one syllable but two morphemes, *walk* and *ed*. *Slumber* consists of two syllables, but only one morpheme. Students must recognize this distinction to understand structural analysis concepts such as *prefix* and *suffix*. Otherwise, they may not distinguish between real and "phantom" prefixes (the *re* in *reconsider* is a real prefix, whereas the *re* in *reality* is a "phantom" prefix). Students who fail to make such distinctions can end up looking for "little words in big words," finding a *moth* in *mother* or a *fat* in *father*.

Distinguishing between structural analysis and phonics on the basis of the nature of the word parts makes it clearer where the line between the two can best be drawn. For example, although syllabification is often labelled as a form of structural analysis, we can reasonably assign it to the domain of phonics, since syllables are units of pronunciation rather than meaning. It is clear, however, that too rigid a line cannot be drawn. The common use of the terms structural analysis and phonics does not respect the distinction we have made; the *Dictionary of Reading and Related Terms* (Harris & Hodges, 1981), for example, defines structural analysis as "a word identification technique for breaking a word into its pronunciation units."

Another problem is that the concept of morpheme does not have clear boundaries. A morpheme is defined as a minimal meaningful unit in the language. The division of *snowman* into *snow* and *man*, and *fleeing* into *flee* and *ing* into morphemes is straightforward enough (although it is difficult to put into words the exact meaning of *ing*). But in some cases the analysis of a word into smaller units on the basis of meaning becomes problematic. First of all, there are numerous cases of semantic irregularity--words such as *understand* or *foxtrot* whose meanings bear little if any relationship to the meanings of their component parts. Then there are bound morphemes, or morphemes that occur only in combination with other morphemes, never as words in their own right. This category includes prefixes and suffixes, whose meanings are often difficult to state with any degree of precision. It also includes stems borrowed into English from Latin and Greek. Some of these have consistent meanings--for example, the *hemo* in *hemophilia*, *hemorrhage* and *hematology*. Others have no discernable core of

meaning to those not knowledgeable about their history. The morphemes *ceive* in *deceive*, *conceive*, and *receive* or the *fer* in *transfer* and *refer* do not convey meaning to most American students. The meanings of many Latin and Greek prefixes (the *ob* in *obtain*, the *apo* in *apology*) can be even more obscure.

Thus the definition, "The use of word parts to determine the meaning," does not imply a sharp boundary between the domains of structural analysis and phonics. In fact, this definition does not provide a clear boundary for the scope of the term structural analysis at all. English word structure is rife with partial regularities and semantic irregularities. Therefore, any instructional approach to structural analysis *must* explicitly and frequently warn students about two things: (1) the possibility of being misled by the meanings of word parts, and (2) the need to be flexible and sensitive to context when using the meanings of word parts to figure out the meanings of new words.

Research provides some evidence that instruction in structural analysis can enable students to deal more effectively with new words (Graves, 1986; White, Power, & White, 1989). What we know about the structure of English words in particular, and about what constitutes sound instructional practice in general, provides us with some basis for evaluating instruction. However, relatively few studies have examined the effectiveness of instruction in structural analysis, and none that we are aware of have compared the relative efficacy of alternative methods of instruction. In investigating basal reading programs, we attempted to describe their structural analysis instruction and evaluate what we found, according to some general instructional principals that derive from research about structural analysis. But before reporting our examination of the reading programs, we will review the meanings of some of the terminology basic to structural analysis.

Affix. Affixes include *prefixes* and *suffixes*. A distinction can be made between *inflectional* and *derivational* affixes. Inflectional affixes mark number and tense. Words differing only in their inflectional affixes are considered to be different forms of the same word (e.g., *help, helps, helped, helping*). In English, inflections are usually marked by suffixes. On the other hand, derivational affixes appear as both prefixes and suffixes and result in different words (*helpless, unkind*) rather than in different forms of the same word. In English, all prefixes are derivational affixes; for example *underestimate, disobey*, and *inconsiderate* are considered to be separate words from their stems. We use the term *derivative* for any word containing at least one derivational suffix or prefix.

Neutral affixes are those that can be added only to free morphemes, that is, morphemes that can stand alone as words. For example, *-ness* is a neutral suffix. When you take *-ness* off a word--if it is really a suffix in that word, that is--you always have a word left. *Non-neutral* affixes, on the other hand, can be added either to free or bound morphemes. The suffix *-ity* is a non-neutral suffix; it can be added to words (as in *rationality*) or to bound morphemes (as in *capacity*). Neutral suffixes do not change the spelling of a word, except for the regular change of *y* to *i* as in *happiness*, and seldom change its pronunciation (the word *business* is an obvious but lone exception). On the other hand, non-neutral suffixes are often associated with changes in both spelling and pronunciation, as can be seen in pairs such as *sane/sanity, profound/profundity,* and *pronounce/pronunciation*. Not surprisingly, there are differences in the way neutral and non-neutral suffixes are learned (Tyler & Nagy, 1989).

Root, base, stem. The terms root, base, and stem are used more or less interchangeably for what is left when the affixes are removed from a word or when a compound word is divided into parts. To the extent that a distinction is made among these terms, *root* and *base* refer to a single morpheme (i.e., what is left when a word has been analyzed exhaustively). *Stem*, on the other hand, is most often used for what is left when a single particular affix has been removed. For example, *disagree* would be called the stem of the word *disagreement*. The terms *root* or *base* would be reserved for *agree*.

Compound. A compound is usually defined as a word made up of two or more other words. In other words, compounds are typically made up of free morphemes (*keyboard, headache*). However, words

such as *petrochemical* or *thermometer*, which contain bound Greek or Latin stems, are also usually classed as compounds. The terms *hyphenated compound* and *open compound* are used for compounds in which the parts are separated by a hyphen (*free-lance*) or space (*ice cream*), respectively.

Analysis of Instruction in Basal Reading Programs

We reviewed structural analysis instruction and practice in the teachers' manuals and student workbooks of six basal reading programs. The six programs were selected on the basis of their popularity and because they represented a diversity of approaches to instruction. All programs had a 1989 copyright. We focused our attention on prefixes, suffixes, and compound words.

We conducted our review of structural analysis instruction by seeking answers to a series of questions that were directed toward three aspects of instruction and application: (a) definitions and rationale for instruction, (b) approach and procedures, and (c) application opportunities. Our questions were formulated as a means of gathering information about the lessons.

[Insert Table 1 about here.]

We did not begin with a perceived model of ideal instruction against which we measured our observations, nor did we begin with the belief that there exists a right answer to each of the questions. Rather, our goal was to examine, discuss, and comment on the structural analysis instruction in these programs. We are quite aware that not all structural analysis instruction originates in basal reading programs. We believe, however, that most teachers will identify the activities we found in these programs as fairly typical of structural analysis instruction.

In the sections that follow, we consider our questions as we review prefix, suffix, and compound word instruction in the basal reading programs we examined. For each aspect of instruction or application discussed, we list questions, discuss findings, and present comments.

Definitions of Terms and Rationale for Instruction

Definitions of Terms

Two questions are about the definitions of metalinguistic terms (terms that refer to linguistic concepts) such as *prefix*, *suffix*, and *stem*.

> *Are metalinguistic terms used and if so, which ones?*
> *If used, are they defined prior to use?*

Prefixes. All the programs we examined included a definition of *prefix*. In most programs, the definition does not differ substantially in the sixth grade from its initial presentation, usually in the second grade. These definitions contain some or all of the following factors: "a prefix is a word part," "it appears at the beginning of a word," "it changes the meaning of the base word," and "it has meaning independent of the base word." All programs include the concepts of "word part" and "appearance at the beginning of a word." Five of the six programs explicitly include the idea that the addition of a prefix to a word changes its meaning. In contrast, only three programs explicitly state that a prefix has meaning independent of a root. The definitions are presented in Table 2.

[Insert Table 2 about here.]

With consideration for the variations in the factors included and the syntax employed, the following composite definition is representative of the definitions for prefix presented in these programs: *A prefix*

is a word part added to the beginning of a base word to form a new word. A prefix changes the meaning of the word.

Of some interest is that two programs do not begin instruction with the term *prefix*. Program B starts prefix instruction in the second grade with the term *beginning*: The teacher is instructed to, "Ask what beginning was added to *dressed* to make *undressed*, and how the beginning changed the meaning." The next paragraph continues, but with no additional explanation: "Have children tell you the prefix, or beginning, of each word." Whether it is intended that the two terms are to be used interchangeably is not clear. Later, in the third-grade level the teacher is asked to "Write the word *disappear* on the board . . . . Then ask how the addition of *dis* to *appear* changed the meaning of the word . . . . Explain the definition of prefix." Similar examples of failure to define metalinguistic terms, or inconsistent use of terminology, were found repeatedly in each of the six programs.

Another alternative to the term *prefix* appeared in Program D. The term *common syllable* ("a syllable that occurs in many words") is introduced at the second grade. *Prefix* is not introduced until the third grade. Neither teachers nor students are given a reason for the substitution for *common syllable* for the more conventional terminology, nor does the third-grade manual attempt to relate the meaning of *prefix* to *common syllable*.

Suffixes. The location of the suffix and the concept of change in the part of speech distinguish the definitions of suffix and prefix. In the programs we examined, the definitions of suffix include two or more of the following factors: "is a word part," "appears at the end of a word," "results in a change in meaning," "changes the part of speech," and "has meaning apart from that of the base word."

All programs include the idea of a suffix being a word part and appearing at the end of a base word, but references to change in both meaning and parts of speech are included in only four programs. Although only Program D specifically includes the concept of independent meaning of suffixes in its definition, all programs offer meanings for the specific suffixes that are used in the lessons. In Program A, for example, the teacher is directed to

> ask what was added to the word *wash* to make *washable* (-able). Ask pupils to name something that would be *washable* (Possible answers include: clothing, cars, bikes.). Point out that we might say that shoes are 'capable of being washed' or 'likely to be washed' when they get dirty.

The definitions used in the programs appear in Table 3.

[Insert Table 3 about here.]

The following composite definition is representative of the definitions presented in these programs: *A suffix is a word part added to the end of a base word that often changes the meaning of the word and sometimes changes the word's part of speech.*

Compound words. The term *compound word* is used in all programs. The related terms *base words* and *root words* are less frequently used and are not always specifically defined prior to their appearance in a definition of a compound word. More frequent is use of the terms *little words* or *smaller words* to label the parts of a compound word. Program D begins with, "two words that go together to make one word" and does not introduce *compound word* until the following grade level. At that point, "compound word" is to be elicited from the students in response to the question, "Who can remember what we call a word that has been made by putting together two base words?" How the students are to remember what has not been taught is not quite clear.

The definitions of compound word are uniform across programs: A compound word is one word composed of two smaller words. Two programs extend this definition. Program C suggests the possibility of a compound word being comprised of more than two words. Program F introduces open compounds, those written as two words, such as *chuck wagon* and the hyphenation of root words such as *flea-bitten*.

Comments. For the most part, the definitions for the terms *prefix* and *suffix* are adequate. On the other hand, there is some inconsistency in terminology. As mentioned above, initial instruction in one program introduces the term *common syllable* to refer to affixes, and in later grades the program changes to using the terms *prefix* and *suffix*. The same program sometimes uses the term *ending* to refer to suffix. We suspect that such multiplicity of terms has potential for confusing students, unless the relationships among the terms are made clear.

The definitions of compound word used in the programs seem adequate, but programs that do not call attention to the variations of open compounds and hyphenation miss a natural opportunity to expand students' knowledge.

Rationale for Instruction

Two questions relate to purpose:

> *Is a reason given for attention to affixes and compounds?*
> *If so, is it presented as a strategy for word recognition, meaning acquisition, or both?*

Prefixes. Consistently across programs, meaning-getting is the rationale given for prefix instruction. Program A contains the most clearly stated rationale: "Tell students they will learn to use prefixes, or word parts, added to the beginnings of base words to determine word meanings."

Programs often combine the rationale with the strategy to be used. In Program C, the teacher is asked to "Explain that to figure out the meaning of an unfamiliar word with a prefix, they [students] should use the meaning of the prefix together with the meaning of the base word." In Program D students are assured that, "When they know the meanings of prefixes, suffixes, and root words they can figure out the meanings of words that have had these word parts added."

An additional reason for attention to prefixes, that of word recognition, is mentioned directly or indirectly in five of the six programs. In one program, teachers are to "Tell pupils that when they come to a word with a prefix, they can break the word into the root word and the prefix to help them pronounce the word" and to "Explain that recognizing words that have beginnings added to them can help them read new words."

Suffixes. As in prefix instruction, the reason for attention to suffixes stated in all programs is meaning acquisition. Although much variation exists in how this is said, the message expressed in Program F is typical: "A word part that is added at the end of a root word is called a suffix. If you know the root word, you can figure out how to say the new word and what it means." A note in Program A adds further reason for attention to suffixes in the statement, "writers can make new words with suffixes." Such an explicit reference to writing is infrequent.

The strategies for the analysis of words containing suffixes are strikingly similar from one program to another (and to those of prefix analysis). The process prescribed usually includes three steps: (1) identify the root and suffix; (2) think of the meaning of each segment; (3) link the meanings of the segments. An additional step, (4) use context for additional cues or to check plausibility--appears in

three programs. For example, program F advises "reread to confirm that the word makes sense in the sentence."

Compound words. Each program provides two reasons for attention to compound words: word recognition and meaning acquisition. For example, in Program D, teachers are asked to tell their students that "knowing how to figure out compound words can help you become a better reader" and "help you better understand what you read." Program F is more direct. Teachers are to tell children, "Point out that when you come to a compound word you can break the long word into the smaller words. Explain that this will help you to pronounce the word and often to figure out what the long word means."

The strategies presented for the analysis of compound words have one or more of the following components: "break the word into its base words," "consider the meaning of each component," "compose the meaning of the compound word from the base word meanings," and "refer to context for further clues to meaning."

Comments. To state clearly the reason for directing students' attention to affixes seems to be a simple task. We are, therefore, puzzled by the indirectness and lack of specificity in many of the lessons. A simple statement of purpose, indicating that learning about prefixes and suffixes will help students to better recognize words and learn something about their meanings, would seem appropriate. Such statements of purpose could then lead into the presentation of a strategy for analysis of words with affixes.

Although all of the programs suggest strategies for analysis of words to enhance recognition, meaning, or both, these strategies are not always presented in a consistent manner within a given program. The following examples illustrate the differences across the programs.

Program A advises, "First identify the prefix and base word. Next think about the meaning of the prefix. Then put this meaning with the base word to figure out the new word's meaning. Finally, see if the meaning makes sense in the sentence."

In contrast, Program F advises, "When you're reading and you come to a word you don't know, see whether it is a root word with a prefix or suffix added to it. Use what you know about the root word and the prefix or suffix to figure out the word."

In its sixth-grade presentations, Program B becomes fanciful. In an effort to link prior personal experience to the analysis of derivatives, the teacher is directed to

> ask volunteers to point out some of the foods that they most enjoy eating just before (appetizers) or just after (desserts) their main meals . . . . Explain that just as certain appetizers and desserts can be used to make a simple meal more elaborate or a rich meal better-balanced, there are word parts in the English language that can be added to the beginning or end of root words to give those words new meanings. Tell students that when they come to an unfamiliar word, they may be able to unlock its meaning by analyzing its root and prefix or suffix.

This analogy does not appear to us to be especially helpful. Although we agree that new concepts should be tied to familiar experiences, we believe that in the case of structural analysis, the most relevant personal experience is students' knowledge of familiar suffixed and prefixed words.

We would recommend that to explain a prefix such as *un-*, the teacher start by identifying examples of words containing that prefix *un-* that are already familiar to the student (*untie, unbutton* for one meaning

of *un*, or *unhappy, unable* for the other meaning). The first step is to call the students' attention to the structure of those words they already know, so that they will have an example-based feel for the meaning and function of the prefix. Only then, we would argue, can one go on to the analysis of unfamiliar words. It might also be helpful to ask students to attempt to define or explain the contribution of affixes, based on their knowledge of familiar words.

The rationale for attention to compound words is well established in each program, but not all examples are carefully chosen. For instance, this example left us puzzled: How is the second-grade student to determine the meaning of *tablespoon* as "a spoon used to measure" from the sentence, "I need one tablespoon of water?"

Approach and Procedures

Direction of the Analysis

Two questions are about the direction of the analysis--part to whole, or whole to part.

> *Are students asked to analyze derivatives and compounds?*
> *Are students asked to construct derivatives and compounds from parts?*

Prefixes. Two approaches are used for the introduction of prefixes. One is analytic, that is, a derivative (for example, *retrace*) is presented for subsequent analysis into prefix (*re-*) and root (*trace*). The other is synthetic, that is, the prefixes and roots are presented separately, and then combined to form derivatives.

Two of the programs were consistently analytic. In contrast, the other four programs adopted a mixed approach, sometimes having students construct derivatives from roots and prefixes, and other times having them analyze derivatives into word parts. Typical of these is Program B. In the second grade, an analytic approach is used in which the teacher is asked to

> Write the following words on the chalkboard: *return, repay*. What two letters do you see at the beginnings of these words? Have volunteers circle the letters. Explain that when *re-* is added . . . ."

By the sixth grade, Program B uses the synthetic approach. The students are asked to construct derivatives by combining prefixes and roots.

Suffixes. A predominantly analytic approach was also used for suffixes. Although we found a few synthetic tasks in which students were to combine root words with separately listed suffixes, the most common approach is to have students analyze whole words into stems and suffixes.

Compound words. An analytic approach, in which compound words are presented and the teacher divides them into constituent base words, was found in all of the programs. Typical is a chart in Program A, showing six compound words, that is to be presented with the direction, "Have children identify the two smaller words that make up each compound word. Then have children read each compound word aloud."

Comments. Giving students experiences in both analyzing derivatives into word parts, *and* constructing derivatives by putting together word parts appears to be instruction that will maximize flexibility in their use of structural analysis.

However, we believe that the analytic approach should predominate. Students should be led to recognize the structure of familiar words before they are asked to create new words, and because the analysis of words into their component parts is in keeping with the primary purpose of structural analysis--determining the meaning and pronunciation of affixed or compound words while reading connected text.

Use of Context

Two questions are about the use of context.

> *Are context sentences used to illustrate the contribution of affixes and the meanings of compound words?*
> *If used, do context sentences come from the selections in the student text?*

Prefixes. Five programs consistently present derivatives in sentences. It is exceptional, however, for any of these sentences to come directly from the student text selections. One exception occurs in Program B. The teacher is asked to "Direct the children's attention to the first paragraph of the story." (The derivative they are studying appears in a sentence in that paragraph.)

Instruction and the selections in the student texts are linked in two other ways. Program C attempts to link structural analysis instruction and student texts through teaching charts. The sentences on these charts relate to the topic of the selection and employ its vocabulary but are not taken directly from the text. Another kind of link between instruction and the student text occurs in Program F. The student text includes special explanatory selections that define prefixes, present example sentences, and describe a strategy for an analysis of the derivatives.

Another use of context, but not with sentences from the student text, occurs in Program C. The teacher reads sentences aloud. The students are asked to identify the derivatives in these sentences that contain previously taught prefixes. The intent is that from two examples students are to figure out the meaning of the prefix and subsequently arrive at the meaning of the derivative.

Suffixes. Suffixes, like prefixes, are usually introduced in derivatives that appear in context sentences. We saw no substantial differences in this respect between the presentation of the two affixes.

Compound words. In all but Program E, compound words are regularly introduced in sentences, or are immediately followed by sentences that demonstrate their use. These demonstration sentences appear on prepared teaching charts or are to be written on the chalkboard by the teacher. In contrast, Program E sometimes suggests that the teacher list on the chalkboard compound words from the selections or that students locate the words in the text selection. This approach presents the words from connected text, but seems more of an identification task than one of decoding and meaning construction because the students are not directed to make use of the context.

Demonstration sentences taken directly from the text selection appear in Program B. Meaningful links to text selections, however, are achieved in Program C and Program F. Program C links text selections and instruction by including a two-page compound word selection in the students' text. The term compound word is defined, a purpose for attention to compound words is proposed, analysis strategies are presented, and examples from the selection are discussed. The selection reads:

> A compound word is a word that is made by joining two smaller words together to make one new word . . . The word *landmark* is a compound word that was also used in [the story] . . . Look for the smaller words that make the compound word. Think of their meanings. Then figure out the meaning of each word. Understanding

> compound words will make it easier for you to know the meanings of many words you read every day.

Program F makes the link by using the compound words that appear in the selection in the demonstration sentences. The sentence "At last he found some popcorn" appears on the teaching chart and the word *popcorn* appears in the selection.

Comments. If a goal of structural analysis instruction is to help students understand structural analysis as a viable strategy for figuring out unknown words, getting them "into the text" would seem an essential component of every structural analysis lesson. That more use is not made of the student text is surprising.

It should be noted that context sentences play a more important role in explaining suffixes than they do for prefixes. There should be relatively little difficulty for students to understand that *unhappy* means "not happy." A sentence context may be helpful, but it does not seem essential to the explanation. On the other hand, the difference between the words *frustrate* and *frustration* lies almost completely in the way these two words are used in a sentence. Illustrative sentences are crucial to conveying the distinction between the two.

Affix Definitions

Two questions are about the definitions and examples used to explain the meanings of affixes.

> *Are definitions for affixes given?*
> *Are examples consistent with the definitions?*

Prefixes. All the programs present one or more definitions for prefixes. In some cases, only one definition is given for a prefix with more than one meaning. For example, in one program, *un* is given only the meaning "not," which could lead students to misinterpret a word like *unpack*. Some programs, on the other hand, offer several possible definitions for a prefix. Thus, when *un* is described as meaning either "not" or "the opposite of," both *unhappy* and *untie* are more easily given accurate interpretations.

Suffixes. All programs provide meanings of suffixes that can then be applied to numerous roots. For example, in one program students are taught that *-or* refers to "one who" and that *-ible* means "capable of." Although these definitions are presented as having independent identifiable meanings, they are illustrated with specific examples. The examples in all programs are consistent with the suffix definitions. Overgeneralizations and less-than-accurate definitions that can result from defining suffixes out of context are largely avoided by the presentation of multiple meanings. For example, *-ment* is presented as meaning "having, showing, or doing something" followed by the derivative *agreement*.

Comments. We found that, although most of the words used as examples were consistent with one of the alternative definitions provided, the match was not always perfect nor was mention always made of the exceptions. Two instances from Program E are notable. *Dis-* is defined as "lack of" or "not" and the example consistent with that definition, *dislike* is presented. Immediately following and without further disclaimer, however, is *discourage*, defined as "take away courage." No explanation is given. The definition simply appears. In the second instance, the prefix *out-* is defined as "to do better" followed by the example *outburst*. Are students to learn that *outburst* means "to burst better"?

Many such problems are avoided by the presentation of multiple definitions. In fact, sometimes as many as four definitions for one prefix are given. Our question is: Can and do children find four definitions just too much to sort out and to remember? And, do they therefore ignore the lesson?

This leaves us with something of a paradox. A single definition for an affix is likely to be vague and inaccurate for many of the words that the students will encounter. On the other hand, a list of definitions that covers several different meaning of an affix is likely to be more confusing than helpful to students. How should this problem be resolved? Here are steps we recommend. First, teachers should explain that the meaning or function of an affix can seldom be captured in one simple definition. (This caution is even more true, in general, for suffixes than prefixes.) Therefore, in explaining affixes, there should be less reliance on definition and more on examples of familiar words containing the affix. We recommend that affixes be explained by comparing the meanings and usage of the word with and without the affix. We also recommend that *flexibility* in use of structural analysis be stressed again and again. Students should not be led to expect that they can determine the exact meaning of an affixed word by mechanically combining the meaning of the root and a meaning of the affix.

Thus, in summary, presenting a single definition might lead to overgeneralization, but presenting multiple definitions of affixes is of only limited value in avoiding overgeneralizations. Most important is the use of example sentences to illustrate the contribution of suffixes to a word, and stressing to students the need for flexibility and use of context in the interpretation of affixed words.

Syntactic and Semantic Changes

Three questions are about references to syntactic and semantic changes.

Is change in syntactic function from root to derivative noted?
Is semantic change from root word to derivative explicitly noted?
Are students warned of "phantom" affixes?
Is semantic change from root words to compound word explicitly noted?

Prefixes. It is rare for prefixes to change the part of speech of a derivative. We were not surprised therefore, to find that no program discusses syntax and prefixes. An exception occurs in Program E, which makes note of the possibility of such change in its definitional statement of affixes. This program does not explicitly separate prefixes and suffixes, but directs teachers to inform students that, "affixes are word parts that are added to root words to form new words with new meanings and sometimes a new part of speech."

Consistent with an emphasis on meaning-getting strategies, each program discusses the change in meaning that results from the addition of a prefix to a root word. Program D, however, is distinguished by its repeated references to "making a new word" as opposed to directly stating that the "meaning is changed." Teachers and students using Program D must interpret "new" to mean "changed meaning," as compared to the more conventional use of the term "new word" to designate words not previously introduced for decoding instruction.

In only three of the programs are students warned of the appearance of "phantom" prefixes, or letters at the beginning of words that resemble prefixes, but are not prefixes. (For example, the letters *re* in *reach* do not function as a prefix.) In Program B, the teacher is advised, "You may want to mention that the prefix *dis-* does not necessarily mean "the opposite of" or "not." For example, the word *discover* is an exception." In Program C, it is suggested that the teacher, "Have the children name other words that have the prefixes *mis-* and *non-*. Point out that not all words beginning with the letters *mis* and *non* have prefixes."

Suffixes. Discussion of the syntactic change that results from the addition of a suffix to a root appears in five of the six programs. This change is frequently presented as part of a descriptive definition and is usually accompanied by an example. Program A directs the teacher to, "write the word *weekly* on the chalkboard and circle the letters *ly*. Remind students that a suffix is a letter or letters added to the end

of a word. The word to which a suffix is added is called the base word. A suffix changes a base word's meaning and sometimes changes the way the word is used in a sentence."

Other programs express this change as a difference in "part of speech" and make specific references to nouns and verbs. Program B appears to have tried to combine instruction in semantic and syntactic change. After presenting the words *helper* and *swimmer* on the chalkboard, the teacher is asked to "circle the endings and say that these endings changed the words' meanings from action words to words that mean someone who does the action."

Compound words. In some way, all programs recognize changes in meaning from root words to compound words. However, instruction that explicitly points to recognition of compound words whose meanings are not simply the sum of the meanings of the base words was found in only three programs. For example, Program B presents the word *butterfly*, and asks the teacher to "Point out that when two words are combined to make a compound word, sometimes the meaning of the compound is not the meaning of the two separate words combined. A compound word may have a new meaning."

Comments. The primary function of suffixes is to change parts of speech, so it may be helpful to some students to discuss the contribution of suffixes using grammatical terms like *noun* and *verb*, or paraphrases of these, like "action words" and "words that mean someone who does the action." However, we suspect that such explanations will not be helpful to many students. We would suggest that the meaning of suffixes be explained primarily through the use of example sentences and, in particular, through the use of examples that contrast the use of the suffixed word and its stem.

Checking for Plausibility

One question concerns checking for plausibility.

Are students told to check results of their word analysis with context for plausibility?

Prefixes. To use context as a check on the plausibility of word meaning is almost always a good strategy. We found that only two programs advise such checking.

In Program A, as previously cited in the discussion of the rationale for instruction, students are told to "see if the meaning makes sense in the sentence." When students are presented with prefixes of more than one meaning in Program D, they are told, "The context can help you decide which meaning to use."

Suffixes. We found reference to plausibility in four programs. These references included one obscure presentation in a student activity book and one example of the use of syntax for meaning construction. In Program B, students are asked to "reread the sentences to check your words," and in Program A, direction to use syntax for meaning construction follows a discussion of linking root and suffix meanings.

We found much more straightforward direction in Program F. Students are asked, as a fourth step in meaning construction, to "reread to confirm that the word makes sense in the sentence."

Compound words. The reference to the use of context varies substantially from program to program. In Program A, the teacher is asked to, "Tell children that when they are reading a compound word they do not know, they should look at the two smaller words, figure out what they mean, and then try to read the new word." This lack of reference to the context contrasts with the instruction in Program B, which points up the importance of context: "First you look for a way to break it into smaller parts or words. Next, see if you know either part of the word. Then try to read both parts. Remember that it must make sense in the sentence."

In Program D, the need for the consideration of context to determine meaning is demonstrated through the colorful words *horsefly* and *catfish*.

Comments. The many irregularities within the structure of the English language make using context essential. We suggest that plausibility checks be included as part of all structural analysis instruction.

Spelling Changes

One question is about spelling changes.

Are spelling changes noted when affixes are added?

Prefixes. Attention to the possibility of spelling changes made necessary by the addition of prefixes to root words appeared in only two programs. For example, Program E explicitly states, "A prefix changes the meaning, but not the spelling of the word."

Suffixes. Spelling changes made necessary by the addition of some suffixes are noted in all programs. The kind of attention paid to spelling changes, however, varies substantially across programs. Program A gives a simple direction with specific examples such as, "Review spelling changes in *sensible, usable,* and *believable*." In contrast, Program D presents three generalizations that include doubling the consonant when a suffix begins with a vowel, dropping the final *e* of a base word, and changing the final *y* of a base word to an *i* before adding a suffix.

Comments. Although there is little research on this topic, it is likely that even regular spelling changes (for example, the change from *y* to *i* in *sturdy/sturdiness*) may hinder some students from recognizing morphological relationships among words. Therefore, we recommend that some instructional attention and application opportunities be devoted to spelling changes.

Application

Nature and Frequency

We examined both the teacher's manual and student activity books for answers to questions about the nature and frequency of opportunity for application.

Are there opportunities for application specific to affixes and compound words?
Are opportunities for application included in the student activity book?
Are there application opportunities other than in the activity book?

We found that application opportunities are provided in both the teacher's manuals and the student activity books of all programs, and that there are a variety of such activities.

Structural analysis application pages are only a small part of the student activity books. Depending on the program, between 3 and 6% of these pages are devoted to such activities.

Affixes. The types of activities we found for affixes are listed in Table 4.

[Insert Table 4 about here.]

Exercises in which students complete cloze sentences with derivatives appear in each program, and are, in fact, the most frequently occurring application task in the student activity books. A page usually begins with directions to identify the prefix and root of a derivative. The assumption is that students

will analyze the words and then construct their meanings before completing the sentences. Whether students go through this process probably depends upon their familiarity with the derivatives. For example, asking the students to use the word *return* in a sentence is unlikely to cause them to analyze the word into a prefix and stem.

Programs B and E direct students to selections in their textbooks. The students are directed to identify derivatives that appear in the selections, but are not encouraged to apply meaning acquisition strategies to them. For example, in Program E the teacher is asked to, "Discuss the prefixes *un-* and *re-* and ask the children to find words beginning with these prefixes in the story." Two appropriate derivatives appear in the selection. As mentioned earlier, Programs C and D include special descriptive selections about affixes in the student texts, linking instruction to the reading of connected text.

Program B provides practice in the meaning construction strategy by directing teachers to "Write these words on the chalkboard. *Actor, cheerful, jealousy, believer.* Distribute four blank cards to each child and have them write the number 1, 2, 3, and 4 on the cards. Explain that you are going to read four meanings for each word on the chalkboard. They are to listen carefully as you read the meanings through once. Then you will read the meanings again, and this time they are to hold up the number card that matches the number of the correct meaning . . . . Then have children identify the base word and the suffix, and use the base word and the displayed word in sentences that show their different meanings."

This task is of questionable value for two reasons. First, it requires the identification of meaning before the identification of root and suffix, and second, it complicates the meaning identification process by heavily loading the memory requirements.

Compounds. Opportunities for reading and writing compound words are provided in all teachers' manuals and in all levels of pupil activity books. We found 11 types of activities that are described in Table 5.

[Insert Table 5 about here.]

Although application tasks are provided in the pupil-activity books of all programs, we found little variety in the tasks within programs.

Comments. We believe that structural analysis application tasks are valuable only if they enhance and reinforce students' ability to analyze or construct and, of course, comprehend derivatives and compound words encountered in text. We had hoped to find application activities that would include discussing the derivatives and compound words found in connected text. Within the lessons, however, directions to pay attention to the derivatives and compound words in text are limited.

These activities included dividing compound words into their base word constituents and/or using either the compound or base words to complete cloze sentences. We noted that many exercises could be completed without figuring out the meaning of the compound word or its constituent base words, especially if students were experienced "workbookers" (Osborn & Decker, 1990). That is, the patterns of response are so predictable that correct answers could be given without meaning construction. For example, in one task students needed only to recognize the pattern of reversing the root words to form the correct compound word.

Games are another form of application. Two programs suggest the building of compound words through matching puzzle pieces containing base words. These games provide opportunity for word construction and thus represent a shift in presentation from the programs' initial analytic approach. However, they do not typically require the students to go beyond word building to meaning construction.

Recommendations and Conclusions

Our first impressions of structural analysis lessons in basal reading programs was that they frequently contained confusing and sometimes inadequate suggestions for instruction and application. But as we examined the programs more carefully, we found a number of adequate instructional ideas. Most of the instructional problems appear to be those of omission rather than commission. For example, students were seldom asked to apply what they had learned about structural analysis to the task of constructing meaning in extended texts. Students were seldom explicitly advised to check the results of word analysis against the contexts. They were almost never warned of the limitations of structural analysis.

From our review of the literature about word parts and our examination of structural analysis instruction, we have come to believe that the development of strategic and flexible use of word parts as a means of constructing word meaning should be the primary goal of structural analysis instruction. But because the information in word parts--although usually helpful--can be incomplete and, in fact, sometimes misleading, we also believe that structural analysis instruction must help students become fully aware of its limitations. Thus, good structural analysis instruction must be grounded in context--that is, students must have the opportunity to apply and use their word part knowledge to the reading of connected text.

Strategic use of structural analysis involves also using it in concert with other strategies for dealing with new words. We recommend that structural analysis be incorporated into a more comprehensive set of strategies which include deciding how important a word is for understanding the text, whether it is necessary to know the precise meaning of the word, and whether using a dictionary or glossary is worth the effort.

Effective instruction should aim for strategic use of structural analysis. Research indicates that most students have acquired the basic skill of structural analysis--recognizing that a new word can sometimes be broken into familiar parts that reveal something about its meaning--before fourth grade (Tyler & Nagy, 1989). What is less likely to be acquired "naturally," and more in need of instructional attention, is knowing *when* to use structural analysis. Although some programs warn students about the existence of "phantom" affixes, we found little instructional opportunity for students to deal with such problems. We recommend that students be given practice in deciding if unfamiliar words can (orthographically at least) be broken into a familiar stem plus an affix, and then asked to decide whether their analysis leads to a meaning compatible with the context.

We suggest that structural analysis instruction will be strengthened by closer and more intense alignment with the real task that reading actual text presents to students--that of meaning construction. Specifically, we urge that structural analysis instruction include more opportunities for students to determine the meanings of affixed and compound words in the context of the narratives and expository prose they are reading.

Research is still necessary on a number of topics. First, only scanty information is available about what students know about word structure, and when and how they acquire this knowledge. More research is needed to identify the types of misconceptions students have about word structure. Tyler and Nagy (1989) found that students acquire different aspects of knowledge about word structure at different rates, and that different types of suffixes involve qualitatively different types of learning. Their study, however, was only a beginning attempt at distinguishing different aspects of students' knowledge of word structure.

Second, little is known about how skilled readers utilize structural analysis in reading. Some evidence (Nagy, Anderson, Schommer, Scott, & Stallman, 1989) indicates that skilled readers use knowledge of morphological structure in the recognition of familiar words; however, the evidence is far from

conclusive. Some researchers (e.g., Adams, 1990) argue that syllables play a more important role than morphemes in word recognition. Morpheme and syllable boundaries often coincide, as in *dark-ness* or *thank-ful*. Sometimes they do not, as in *in-for-ma-tion*, in which the unity of the stem *inform* is lost in the division into syllables. Much more needs to be known about the relative contribution of syllable structure and morphemic structure to word recognition.

Third, the extent to which students can profit from knowledge of bound stems while reading is also unclear. Research by Carroll (1940) and Shepherd (1973) suggests that instruction in bound stems is not effective. On the other hand, other researchers (Nagy & Scott, 1990; Sternberg & Powell, 1983), have found that students' knowledge of bound stems increases through high school and into college, and that it is possible that knowledge of bound stems is useful for certain types of bound stems or for particular functions (e.g., in learning and remembering technical terminology.)

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Table 1

Questions about Structural Analysis

Definitions and Rationale for Instruction

Definitions

Are metalinguistic terms used and if so, which ones?
If used, are they defined prior to use?

Rationale for Instruction

Is a reason given for attention to affixes and compounds?
If so, is it presented as a strategy for word recognition, meaning acquisition, or both?

Approach and Procedures

Direction of the Analysis

Are students asked to analyze derivatives and compounds?
Are students asked to construct derivatives and compounds from parts?

Use of Context

Are context sentences used to illustrate the contribution of affixes and the meanings of compound words?
If used, do context sentences come from the selections in the student text?

Affix Definitions

Are definitions for affixes given?
Are examples consistent with the definitions?

Syntactic and Semantic Changes

Is change in syntactic function from root to derivative noted?
Is semantic change from root word to derivative explicitly noted?
Are students warned of "phantom" affixes?
Is semantic change from root words to compound word explicitly noted?

Checking for Plausibility

Are students told to check results of their word analysis with context for plausibility?

Spelling Changes

Are spelling changes noted when affixes are added?

Table 1 (Continued)

Application

Nature and Frequency

Are there opportunities for application specific to affixes and compound words?
Are opportunities for application included in the student activity book?
Are there application opportunities other than in the activity book?

Table 2

Prefix Definitions From Six Teachers' Manuals

Program A: Remind students that a prefix is a letter or group of letters added to the beginning of a word and that a prefix changes the meaning of the word.

Program B: A prefix is a word part added to the beginning of a word to change its meaning.

Program C: A prefix is a word part that is added to the beginning of a word to change the meaning of the word in some way.

Program D: What is a prefix? ... (a word part added to the beginning of a base word). Each prefix has a meaning of its own. When a prefix is added to a base word, the new word usually has a different meaning from the base word.

Program E: Prefix: word part added to the beginning of a word to form a new word with a new meaning.

Program F: A prefix is a word part added to the beginning of a root word to make a new word.

Table 3

Suffix Definitions From Six Teachers' Manuals

Program A: Remind pupils that a suffix is a letter or group of letters added to the end of a word and that a changes the meaning and sometimes the part of speech of a word.

Program B: A suffix is a word part added to the end of a word to change its meaning.

Program C: A suffix is a word part that is added to the end of a word and changes the meaning of the word in some way. Explain that the meaning of a suffix can often be determined by looking at the way the suffix is used with words.

Program D: The word part *ly* that was added to the end of the word *safe* is called a suffix. Tell students that prefixes and suffixes are word parts that have their own meanings.

Program E: Suffix: word part added to the end of a word to form a new word with a new meaning and sometimes a new part of speech.

Program F: A suffix is a word part added to the end of a root word to make a new word. An example of a suffix is *less*.

Table 4

Types of Application Activities

Given one or more affixes, generate a list of derivatives.

Given a root word, generate a list of derivatives.

Given affixes and stems, compose derivatives by writing or matching.

Supply derivatives and/or root words in cloze.

Compose oral or written sentences employing derivatives and/or root words.

Identify derivatives in given sentences.

Identify stem and/or affix in a given derivative.

Compose and state the meaning of a derivative (usually presented in context).

Indicate the meaning of a given derivative in multiple choice format.

Identify and read derivatives in student text selection.

Identify and read derivatives in text other than selection.

Draw pictures to illustrate the meanings of derivatives.

Locate definitions of derivatives in a dictionary.

Table 5

Compound Word Application Activities

Given one root word such as *snow*, generate as many compound words as possible.

Given root words, compose compound words by writing or matching.

Generate a list of known compound words.

Divide given compound words into component root words.

Complete sentences by choosing from given compound words.

Complete sentences by using the root words identified in given compound words.

Compose and state, or indicate from multiple choice, the meanings of compound words from their root words.

Compose and state, or indicate from multiple choice, the meanings of compound words from presented context.

Identify and read compound words in the text selection accompanying the lesson.

Identify and read compound words in text other than the lesson selection, including word lists and sentence charts.

Compose and write sentences containing compound words.